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SECTION 07131

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SECTION 07131

ELASTOMERIC MEMBRANE WATERPROOFING

PART 1 GENERAL

This section covers the furnishing and installation of elastomeric membrane waterproofing at the new Central Control Station.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 297	(1993) Rubber Products - Chemical Analysis
ASTM D 412	(1997a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 471	(1996) Rubber Property - Effect of Liquids
ASTM D 624	(1998) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1171	(1994) Rubber Deterioration-Surface Ozone Cracking Outdoors or Chamber (Triangular Specimen)
ASTM D 4637	(1996) EPDM Sheet Used in Single-Ply Roof Membrane
ASTM E 96	(1995) Water Vapor Transmission of Materials
ASTM E 154	(1988; R 1993) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM G 21	(1990) Determining Resistance of Synthetic Polymeric Materials to Fungi

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL

PROCEDURES:

SD-04 Drawings

Waterproofing System; FIO.

Detail drawings showing size of sheets, position of sheets and splices, flashing and termination details.

SD-06 Instructions

Installation; FIO.

Manufacturer's instructions for installation of the elastomeric membrane, including procedures for preparing the membrane for use, flashing, and splicing. Instructions shall include recommended or required protective covering and procedures for safe handling and use of cleaners, adhesives, and sealants.

1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered to the job site in unopened containers bearing the manufacturer's name, brand name, and description of contents. Membrane, flashing, and adhesives shall be stored in clean, dry areas. Storage temperature for adhesives shall be between 60 and 80 degrees F. Protection board shall be stored flat and off the ground.

PART 2 PRODUCTS

2.1 MATERIALS

Adhesives, mastics, cements, tapes, and primers shall be as recommended by the membrane manufacturer and shall be compatible with the material to which they are to be bonded.

2.1.1 Performance Requirements

All membranes shall meet the following requirements when tested by the referenced ASTM standards:

ASTM E 154	
Puncture Resistance	40 pounds, (min.)
ASTM E 96, Procedure B	
Water Vapor Transmission at	0.25 perms (max.)
80 degrees F Permeance	
ASTM G 21 or	
ASTM E 154	
Resistance to Soil Bacteria or Fungi	No sustained growth or discoloration after 21 days

2.1.1.1 Butyl Rubber

Thickness, plus or minus 10 percent	60 mils
ASTM D 297	
Specific Gravity	1.2 plus or minus 0.05

ASTM D 412 Tensile Strength	1200 psi (min.)
ASTM D 624 Elongation	300 percent (min.)
ASTM D 624 Tear Resistance	125 lb./inch (min.)
ASTM D 471 Water Absorption 168 hours @ 158 degrees F	plus 2 percent (max.)
ASTM D 1171 Ozone Resistance 50 pphm in air 100 hours @ 104 degrees F	20 percent

2.1.1.2 Plastic Elastomeric Sheeting

Membrane shall be a minimum of 56 mils thick and shall meet the following requirements:

ASTM D 412, Die C Textile Strength	220 psi (min.)
ASTM D 412, Die C Elongation	250 percent (min.)
ASTM D 1004 Tear Resistance	350 lb./inch (min.)

2.1.1.3 Composite Self-Adhering Membrane

Membrane shall be a polymeric sheeting integrally bonded to rubberized asphalt with a minimum thickness of 60 mils.

2.1.1.4 Chlorinated Polyethylene (CPE) Sheeting

Membrane shall be uncured chlorinated polyethylene, synthetic elastomeric sheeting of 40 mils nominal thickness.

2.1.1.5 Chloroprene

Chloroprene membrane shall conform to ASTM D 4637, Type II, Grade 1, Class U, 60 mils minimum thickness.

2.1.1.6 Ethylene Propylene Diene Monomer (EPDM) Membrane

EPDM membrane shall conform to ASTM D 4637, Type I, Grade I, Class U, 60 mils minimum thickness.

2.1.2 Vertical Membrane Waterproofing Protection Board

Protection board for waterproofing membrane shall be 1/2 inch minimum asphalt plank or premolded bituminous protection board; 1/8 inch thick.

2.2 ACCESSORIES

Flashing, counterflashing, expansion joint covers and corner fillets shall be as recommended by the membrane manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

Waterproofing shall be applied to vertical concrete surfaces below the oil separator pit and the electrical vault. The slabs of the oil separator pit and electrical vault shall be underlain with 6 mil or heavier polyethylene sheeting. The wall of the electrical vault against the lock wall will be unaccessable and will not require waterproofing.

3.2 PREPARATION

Surfaces to which waterproofing is to be applied shall be clean, smooth, and free from deleterious materials and projections. Holes, honeycomb, cracks, or cavities shall be pointed or filled and finished flush with Portland cement mortar. Top surfaces of projecting masonry or concrete ledges below grade, except footings, shall be beveled. Before waterproofing is applied, the surfaces to be covered shall be swept to remove all dust and foreign matter. Concrete surfaces shall be cured 30 days prior to receiving elastomeric waterproofing and shall not be cured with compounds containing wax or oil. Masonry surfaces to be waterproofed shall have joints struck flush.

3.3 APPLICATION

Waterproofing shall be applied in accordance with the manufacturers instructions.

3.4 PROTECTION

Horizontal applications of membrane shall be protected from traffic during installation. No equipment shall be allowed directly on the membrane. Plywood, or similar material, overlayment shall be provided for wheel-ways.

Walkways shall be provided where heavy traffic from other trades is expected. Materials shall not be stored on the membrane. A protective covering shall be installed over the membrane immediately after installation or testing. If membrane is to be exposed, a temporary covering shall be applied to protect the membrane until the protection board is installed.

3.4.1 Projections

Projections passing through membrane shall be flashed as recommended by the manufacturer of the waterproofing membrane.

3.4.2 Counterflashing

Waterproofing connecting with work exposed to the weather shall be counterflashed to form a watertight connection. Upper edge of membrane waterproofing and protective covering shall be counterflashed.

3.4.3 Expansion Joints and Fillets

Expansion joints and corner fillets shall be installed as recommended by

the manufacturer of the waterproofing membrane.

3.4.4 Vertical Membrane Waterproofing

Waterproofing shall be covered with protection board. Edges of protection shall be butted, and exposed surfaces shall be covered by a coating of bitumen.

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SECTION 07220

INSULATION

PART 1 GENERAL

This section covers the furnishing and installation of tapered and flat board insulation for EPDM roofing, concrete floors, and other locations indicated; nailable roof insulation for metal roofing and insulated concrete floors; batt insulation for locations indicated. Work also includes fasteners and/or support fabrics as recommended by the manufacturer and as required for complete and stable installation.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 208	(1995) Cellulosic Fiber Insulating Board
ASTM C 516	(1996) Vermiculite Loose Fill Thermal Insulation
ASTM C 549	(1995) Perlite Loose Fill Insulation
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 665	(1995) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C 726	(1993) Mineral Fiber Roof Insulation Board
ASTM C 728	(1997) Perlite Thermal Insulation Board
ASTM C 1289	(1998) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM F 547	(1977; R 1990) Definitions of Terms Relating to Nails for Use with Wood and Wood-Base Materials

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P9513	(1996) Loss Prevention Data for Roofing Contractors
FM P7825a	(1998) Approval Guide Fire Protection

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir

(1998) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

Application of Insulation; FIO.

Insulation manufacturer's recommendations for the application and installation of all insulation types.

SD-04 Drawings

Insulation Layout; FIO.

Submit shop drawings for tapered roof insulation.

SD-13 Certificates

Insulation; FIO.

Certificates of compliance shall be submitted for all insulation types and felt materials.

1.3 STORAGE OF MATERIALS

Extruded polystyrene shall be stored in accordance with manufacturer's instructions. Other insulation, base sheet, and felt shall be kept dry at all times, before, during, and after delivery to the site and shall be stored in an enclosed building or in a closed trailer. Wet insulation, wet base sheet or wet felt shall be permanently removed from the site. Felts shall be stacked on end one level high. Felt rolls shall be maintained at a temperature above 50 degrees F for 24 hours immediately before laying.

1.4 FIRE CLASSIFICATION

The bottom layer of insulation for EPDM roofing shall have been tested as part of a roof construction assembly of the type used in this project and the construction shall be listed as Fire-Classified in UL Bld Mat Dir or Class I in FM P7825a.

PART 2 PRODUCTS

Insulation requirements for roofing, floors, walls, and other locations indicated are described below. Insulation for precast wall panels is described in SECTION 03425: PRECAST PRESTRESSED CONCRETE. Loose fill insulation for masonry is described in SECTION 04200: MASONRY.

2.1 INSULATION

Insulation shall be a standard product of the manufacturer and shall be factory marked with the manufacturer's name or trade mark, the material specification number, the R-value at 75 degrees F, and the thickness. Boards shall be marked individually. The insulation manufacturing process shall not include chlorofluoro carbons (CFC) or formaldehydes. Insulation and fiberboard shall contain the highest practicable percentage of material which has been recovered or diverted from solid waste (e.g., postconsumer waste), but not including material reused in a manufacturing process.

2.1.1 Tapered and Flat Board Insulation

Tapered and Flat Board Insulation shall be used for EPDM Roofing, Concrete Floors, and Other Locations Indicated. The first layer of insulation over steel decks shall be expanded-perlite insulation board. EPDM roofing is specified below:

2.1.1.1 Expanded-Perlite Insulation Board

ASTM C 728 with a minimum recovered material content of 23 percent of the expanded perlite portion of the board.

2.1.1.2 Polyisocyanurate

ASTM C 1289, Type I, or ASTM C 1289 Type II, having minimum recovered material content of 9 percent by weight of the polyisocyanurate portion of the board. Polyisocyanurate. ASTM C 726. Phenolic Insulation. Phenolic insulation shall be closed-cell phenolic foamboard with density in excess of 2.5 pounds per cubic foot. The top and bottom surfaces shall be covered with a membrane bonded to the phenolic foam during its manufacture. Phenolic insulation shall meet requirements of ASTM C 1289.

2.1.1.3 Polystyrene

Polystyrene shall be in accordance with ASTM C 578, Type II, IV, or X. ASTM C 578, Type I, II, or IV.

2.1.2 Nailable Roof Insulation Below Metal Roofing

Nailable roof insulation below metal roofing described in SECTION: METAL ROOFING, FACTORY-COLOR-FINISHED shall meet physical property requirements of ASTM C 726. Nailable roof insulation shall be composed of 5/8 inch APA exterior grade plywood or oriented strand board, integrally bonded to a polyisocyanurate insulation board. The plywood or oriented strand board shall be factory-routed on all four sides. Total thickness shall be 3 inches, with a minimum R-value of 19. Polyisocyanurate core flame spread shall be less than 25 in accordance with ASTM E 84.

2.1.3 Batt insulation

Batt insulation shall be foil-faced glass fiber conforming to ASTM C 665, Type III, Class B. Fasteners or retainers shall be provided in unfinished spaces, as recommended by the manufacturer, to secure the insulation in place. Foil vapor barrier shall be placed on the warm side (in winter), with joints and penetrations taped, with material recommended by the manufacturer to ensure a vaportight barrier.

2.1.4 Loose Fill Insulation

The loose fill insulation is used for filling block cores in the masonry. The loose fill insulation shall consist of a vermiculite or perlite product, both surface treated for water repellency. Vermiculite insulation shall meet ASTM C 516, Type II, Grade 0 or 1. Perlite insulation shall meet ASTM C 549, Type II or IV.

2.2 NAILS AND FASTENERS

2.2.1 Nails for Fastening Insulation to Flush Mounted Wood Nailers

Nails for Fastening Insulation to Flush-Mounted Wood Nailers shall meet manufacturers recommendations and be a sufficient length to hold insulation securely in place. Nails shall be identified in accordance with ASTM F 547.

2.2.2 Fasteners

Fasteners shall meet insulation manufacturer's recommendations. Fasteners for steel or concrete decks shall conform to FM P7825c for Class I roof deck construction. Fasteners for concrete-faced board insulation, including expansion anchors, washers, and nuts, shall be stainless steel.

2.3 ROOFING FELT

Glass. ASTM D 2178, Type IV, 15 pound thickness.

Organic. ASTM D 226, Type I, 15 pound thickness.

2.4 WOOD NAILERS

Wood nailers shall conform to Section 06100 ROUGH CARPENTRY, including preservative treatment. Continuous wood edge nailers shall be installed as indicated at eaves, rakes, and elsewhere when insulation is applied on the roof deck. Edge nailers shall be not less than nominal 6 inches wide and of thickness to finish flush with the top surface of the insulation. Surface mounted nailers shall be a nominal 3 inches wide by the full thickness of the insulation.

PART 3 EXECUTION

3.1 COORDINATION REQUIREMENTS

Insulation and roofing membrane shall be finished in one operation up to the line of termination at the end of each day's work. Completed sections shall be waterproofed when more than one day is required to finish the roofing. Phased construction will not be permitted.

3.2 ENVIRONMENTAL CONDITIONS

Air temperature shall be above 40 degrees F and there shall be no visible ice, frost, or moisture on the roof deck when the insulation and roofing are installed.

3.3 SUBSTRATE PREPARATION

The substrate construction of any bay or section of the building shall be completed before insulation or vapor retarder work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Substrate surface shall be smooth, clean,

and dry at time of application.

3.4 INSULATION FOR EPDM ROOFING

Insulation shall be laid in two or more layers. Units of insulation shall be laid in courses parallel with the roof slope. End joints shall be staggered. Insulation shall be cut to fit neatly against adjoining surfaces. Joints between insulation boards shall not exceed 1/4 inch. Joints in successive layers shall be staggered with respect to joints of preceding layer. Where insulation is applied over steel deck, long edge joints shall continuously bear on surfaces of the steel deck. Insulation which can be readily lifted after installation is not considered to be adequately secured. Insulation shall be applied so that all roof insulation applied each day is waterproofed the same day. Phased construction will not be permitted. Application of impermeable faced insulation shall be performed without damage to the facing.

3.4.1 Mechanical Fastening

On steel decks, or any slope exceeding 1/2 inch per foot, the first layer of insulation shall be mechanically fastened. Method of attachment shall be in accordance with recommendations of the insulation manufacturer and requirements specified.

3.4.2 Steel Decks

First layer of insulation on steel deck shall be compatible with mechanical fastening. Except for the first layer on steel deck, insulation layers shall be loose laid. For single-ply elastomeric roofing, the final ballast will hold the complete system in place. For standing seam metal roofs, the clips will penetrate the insulation and secure the total system. Provide temporary means to secure loose insulation until final securement.

3.4.3 Protection Requirements

The insulation shall be kept dry at all times. Insulation boards shall not be kicked into position. Open spaces between insulation and parapets, or other walls and spaces at curbs, scuttles, and expansion joints, shall be protected until permanent roofing and flashing is applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces will not be permitted. Smooth, clean board or plank walkways, runways, and platforms shall be used, as necessary to distribute weight to conform to a 35 pounds per square foot live load limit.

3.5 NAILABLE ROOF INSULATION

Installation of Nailable Roof Insulation on sloped areas to receive metal roofing shall be in accordance with the insulation manufacturer's recommendations.

3.6 BATT INSULATION

Batt insulation shall be installed where indicated, so as to provide a continuous thermal and vapor barrier. Fill all voids and secure in place in accordance with manufacturer's recommendations.

3.7 LOOSE FILL INSULATION

Loose fill insulation shall be installed in lifts when necessary to ensure

complete filling of the cores. All all holes and openings in the wall shall be sealed or caulked prior to installing the insulation. Respiratory and eye protection shall be used in accordance with manufactures recommendations.

3.8 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.

- b. Verification of certification, listing or label compliance with FM P9513.

- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.

- d. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.

- e. Inspection of mechanical fasteners; type, number, length, and spacing.

- f. Coordination with other materials, cants, sleepers, and nailing strips.

- g. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.

- h. Installation of cutoffs and proper joining of work on subsequent days.

- i. Continuation of complete roofing system installation to cover insulation installed same day.

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SECTION 07413

METAL ROOFING

PART 1 GENERAL

This section covers the furnishing and installation of metal roofing, including all clips, trim, and fasteners for a complete, weather-tight installation as indicated and specified.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA Design Manual	(1994) Aluminum Design Manual: Specifications and Guidelines for Aluminum Structures
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AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI Cold-Formed Mnl	(1996) Cold-Formed Steel Design Manual
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 463/A 463M	(1997) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 653/A 653M	(1998) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 792/A 792M	(1997) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM B 209	(1996) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 209M	(1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM C 518	(1998) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM D 522	(1993a) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(1989) Specular Gloss
ASTM D 610	(1995) Evaluating Degree of Rusting on

Painted Steel Surfaces

ASTM D 714	(1987; R 1994) Evaluating Degree of Blistering of Paints
ASTM D 968	(1993) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 2244	(1995) Calculation of Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(1997) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 2794	(1993) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(1997) Measuring Adhesion by Tape Test
ASTM D 4214	(1998) Evaluating Degree of Chalking of Exterior Paint Films
ASTM D 4397	(1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D 4587	(1991) Conducting Tests on Paint and Related Coatings and Materials Using a Fluorescent UV-Condensation Light- and Water- Exposure Apparatus
ASTM D 5894	(1996) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV Condensation Cabinet)
ASTM E 84	(1998e1) Surface Burning Characteristics of Building Materials

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(1995) Minimum Design Loads for Buildings and Other Structures
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1.2 GENERAL REQUIREMENTS

1.2.1 Design

Criteria, loading combinations, and definitions shall be in accordance with ASCE 7. Maximum calculated fiber stress shall not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads shall be limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Members and connections not

shown on the drawings shall be designed by the Contractor. Siding panels and accessories shall be the products of the same manufacturer. Steel siding design shall be in accordance with AISI Cold-Formed Mnl. Aluminum siding design shall be in accordance with AA Design Manual.

1.2.2 Architectural Considerations

Panels profile shall be as shown on the drawings.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Roofing drawings; GA.

Shop drawings shall consist of catalog cuts, design and erection drawings, shop coatings and finishing specifications, and other data as necessary to clearly describe design, materials, and sizes, layouts, construction details, fasteners, and erection. Shop drawings shall be accompanied by engineering design calculations for the structural properties of roofing units. Section modulus and moment of inertia of aluminum sheet shall be determined for actual cross section dimensions by the conventional methods for actual design stresses and by effective width concept for deflection in accordance with the AA publication, Specification for Aluminum Structures.

SD-13 Certificates

Roofing; FIO.

Certified laboratory test reports shall be furnished showing that the type of panels being delivered are produced under a continuing quality control program, have been tested within the past 12 months, and have met the quality standards specified in paragraph: FACTORY COLOR FINISH.

SD-14 Samples

Siding; FIO.

One piece of each type and finish (exterior and interior) to be used, 9 inches long, full width.

Fasteners; FIO.

Two samples of each type to be used with statement regarding intended use.

Gaskets and Insulating Compounds; FIO.

Descriptive data.

Sealant; FIO.

One sample, approximately 1 pound, and descriptive data.

Accessories; FIO.

One sample of each type of flashing, trim, closures, caps, and similar items. Size shall be sufficient to show construction and configuration.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weathertight coverings and kept dry. Storage accommodations for metal siding shall provide good air circulation and protection from surface staining.

1.5 DESIGN REQUIREMENTS

Contract drawings indicate extent and general assembly details of the metal roofing. Members and connections not indicated on drawings shall be designed by the Contractor. Roofing shall be designed to provide the minimum section properties for 35 pounds per square foot live load and snow drift requirements of applicable building codes. Roofing shall comply with UL wind uplift Class 90 requirements as detailed in UL 580 and meet performance requirements as tested by the pleated air bag method in accordance with the principles of ASTM E330, Procedure A, adapted to test roofing panels. Aluminum covering shall be designed in acceptance with AA Design Manual.

1.6 WARRANTIES

The Contractor shall provide a weather tight warranty for the metal siding for a period of 20 years to include siding panel assembly, 10 years against the wear of color finish, and 10 years against the corrosion of fasteners caused by ordinary wear and tear by the elements. The warranties shall start upon final acceptance of the work or the date the Government takes possession, whichever is earlier.

PART 2 PRODUCTS

2.1 ROOFING MATERIALS

2.1.1 Roof Covering Panels

Roof covering panels shall be aluminum and shall have a factory color finish meeting the requirements specified below. Panels shall have configurations for clips to occur in standing seams. System for securing the roof covering to structural framing members shall be concealed clip fastening system with nonpenetrating fasteners. Roof covering using concealed clip fastener system shall have no fasteners penetrating the panels except at the ridge, eave, and end laps. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope surface when such slope or height is 30 feet or less. Width of sheets with interlocking standing seams shall provide not less than 12 inches of coverage in place. Height of standing ribs of interlocking panels for adjacent roof sheets shall be not less than 1-3/4 inches. Design provisions shall be made for expansion and contraction at either ridge or eave, or both, consistent with the type of system to be used. All sheets shall be either square-cut or miter-cut.

2.1.2 Soffit panels

Soffit panels shall be aluminum and shall have a factory color finish meeting the requirements specified below. Panels shall have a flat exposed finish face 12" wide. Panels shall be secured at both ends by standard clips and trim pieces. Individual panels will be secured via concealed fasteners located in the male-female interlocking side joint, to provide a flush finished appearance.

2.1.3 Aluminum Covering

Alloy conforming to ASTM-B-209, temper as required for the forming operation, minimum 0.032 inch thick.

2.1.4 Batten

Of material matching the aluminum panels, provide optimal .060" batten, 2" high and 1-1/2" wide for aesthetic sight line. Provide 20 gauge stainless steel batten clip to attach batten cap to standing seam. Provide transition rib covers where roofing changes directions.

2.1.5 Gutters, Downspouts, and Trim

Of material matching the aluminum roof panels. Factory fabricate gutters, downspouts, and trim to the maximum extent possible.

2.2 FACTORY COLOR FINISH

Roof panels shall be a factory color finish on the exposed side. The exterior finish shall consist of a Kynar 500 resin base (polyvinylidene fluoride) coating applied to a cleaned, pretreated and primed surface or a dry film coat bonded by adhesive to a cleaned metal substrate. Color shall be selected from the manufacturer's standards. The dry film thickness of the exterior coating shall be not less than 0.8 mil, exclusive of the primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.3 mil. The exterior color finish shall meet the test requirement specified below. The manufacturer shall have conducted tests on previously manufactured sheets of the same type and finish as proposed for the project. The term "appearance of base metal" refers to the metal coating on the steel or aluminum base metal.

2.2.1 Salt Spray Test

A sample of the sheets shall withstand a cyclic corrosion test for a minimum of 2016 hours in accordance with ASTM D 5894, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of not less than 10, no blistering, as determined by ASTM D 714; 10, no rusting, as determined by ASTM D 610; and a rating of 6, 1/16 to 1/8 inch failure at scribe, as determined by ASTM D 1654.

2.2.2 Formability Test

When subjected to testing in accordance with ASTM D 522 Method B, 1/8 inch diameter mandrel, the coating film shall show no evidence of fracturing to the naked eye.

2.2.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall be tested in accordance with ASTM D 4587. The coating shall withstand the weathering test without cracking, peeling,

blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with tape in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244. For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.

2.2.4 Humidity

When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage or corrosion.

2.2.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 0.500 inch diameter hemispherical head indenter, equal to 1.5 times the metal thickness in mils, expressed in inch-pounds, with no loss of adhesion.

2.2.6 Abrasion Resistance

When subjected to the falling sand test in accordance with ASTM D 968, Method A, the coating system shall withstand a minimum of 50 liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

2.2.7 Specular Gloss

Finished surfaces shall be a specular gloss value of 30 to 70 at an angle of 60 degrees when measured in accordance with ASTM D 523.

2.3 ACCESSORIES

Gutters, downspouts, flashing, trim, molded closure strips, caps, and similar metal accessories shall be not less than the minimum thickness specified for covering except that aluminum gutters shall be not less than .050 inch thickness. Accessories shall be compatible with the covering furnished. Exposed metal accessories shall have a factory color finish to match the panels furnished. Molded closure strips shall be closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering and shall not absorb or retain water. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the manufacturer. Gutters shall be reinforced with 1" x 12 ga. galvanized steel straps or aluminum equivalent at 30 inch maximum spacing.

2.4 FASTENERS

Fasteners shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Aluminum or corrosion resisting steel fasteners shall be used only with aluminum sheets. Exposed fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration. Washer material shall be

compatible with the covering; having a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick. Fasteners used for structural connectors may be the same fasteners used for holding laps, except that they shall provide both tensile and shear strength of not less than 750 pounds per fastener. Nonpenetrating fastener system using concealed clips shall be manufacturer's standard for the system provided.

2.4.1 Screws

Screws shall be as recommended by the manufacturer.

2.4.2 End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not less than 3/16 inch and cap or nut for holding panels against the shoulder.

2.4.3 Explosive Actuated Fasteners

Fasteners for use with explosive actuated tools shall have a shank of not less than 0.145 inch with a shank length of not less than 1/2 inch for fastening panels to steel and not less than 1 inch for fastening panels to concrete.

2.4.4 Blind Rivets

Blind rivets shall be aluminum with 3/16 inch nominal diameter shank or stainless steel with 1/8 inch nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems shall have closed ends.

2.4.5 Bolts

Bolts shall be not less than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.4.6 Clips

Provide UL listed (standard) clip designed to allow panels to thermally expand and contract. Fabricate clips with embossments that raise underside of panels above substrate to allow underside ventilation. Fabricate clips with structurally embossed outstanding legs to prevent distortion due to wind uplift forces.

2.5 INSULATION

Insulation shall be as specified in SECTION: INSULATION.

2.6 SEALANT

Sealant shall be an elastomeric type, conforming to applicable provisions of SECTION: CAULKING AND SEALANTS and containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. Concealed sealant may be the nonhardening type. Field Sealant shall be color coordinated primerless silicone or high grade, non-drying butyl as recommended by panel manufacturer (do not use sealant containing asphalt).

2.7 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.8 FELT UNDERLAYMENT (Solid Substrate)

Number 30 (2 layers of the number 15) asphalt saturated fiberglass felt, nonperforated, with horizontal overlaps and endlaps staggered between layers. Lay parallel to ridge line with 2 ½" horizontal laps and 6" vertical laps.

2.9 SNOW AND ICE GUARDS

Snow and ice guards shall be a clear plastic standard manufacture's item suitable for the intended use. The following manufacturers produce products acceptable for this project:

Snojax Inc.
1405 Brannndton Rd.
Mechanicsburg PA 17055

Snow Gem Inc.
456 S. Dartmoor Lane
Crystal Lake IL 60014

Zaleski Inc.
11 Alden St.
New Britain Connecticut 06053

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be as specified and in accordance with the approved erection instructions and drawings. Coordinate with work of SECTION: INSULATION and SECTION: STRUCTURAL STEEL. Finished structure shall be proven weathertight. Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess amount of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign materials. Stained, discolored, or damaged sheets shall be removed from the site.

3.1.1 Roof Covering Installation

Roof covering shall be applied with the longitudinal configurations in the direction of the roof slope. Method of applying sealant in standing seams shall conform to the manufacturer's recommendations. Fasteners shall be installed in accordance with the manufacturer's recommendations for the roofing system. Fasteners shall penetrate and anchor to the metal roof deck. Scratched, chipped, or otherwise abraded surfaces shall be touched up as necessary with the manufacturer's recommended touch-up paint. Closure strips shall be provided as indicated and where necessary to

provide weathertight construction.

3.1.2 Concealed Fastener Wall Panels

Panels shall be fastened to framing members with concealed fastening clips or other concealed devices standard with the manufacturer. Spacing of fastening clips and fasteners shall be in accordance with the manufacturer's written instructions. Spacing of fasteners and anchor clips along the panel interlocking ribs shall not exceed 12 inches on center except when otherwise approved. Fasteners shall not puncture metal sheets except as approved for flashing, closures, and trim; exposed fasteners shall be installed in straight lines. Interlocking ribs shall be sealed with factory-applied sealant. Joints at accessories shall be sealed.

3.1.3 Dissimilar Metals

Where sheet metal is in contact with dissimilar metals, execute juncture to minimize possibility of galvanic action. At point of contact with dissimilar metal, coat metal with protective paint or tape which can be placed between metals.

3.1.4 Snow and Ice Guards

Snow and ice guards shall be installed using both adhesive and mechanical fastening. Installation shall be in accordance with the manufacturer's instructions.

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SECTION 07530

ELASTOMERIC ROOFING (EPDM)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM D 448	(1986; R 1993) Sizes of Aggregate for Road and Bridge Construction
ASTM D 4637	(1996) EPDM Sheet Used in Single-Ply Roof Membrane
ASTM E 108	(1996) Fire Tests of Roof Coverings

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P9513	(1996) Loss Prevention Data for Roofing Contractors
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SINGLE PLY ROOFING INSTITUTE (SPRI)

SPRI RP-4	(1997) Wind Design Standard for Ballasted Single-Ply Roofing Systems
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UNDERWRITERS LABORATORIES (UL)

UL 580	(1994; Rev thru February 1998) Tests for Uplift Resistance of Roof Assemblies
UL 790	(1997) Tests for Fire Resistance of Roof Covering Materials
UL 1256	(1998) Fire Test of Roof Deck Constructions

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Roofing System; GA.

Drawings showing size of sheets, position of sheets and splices, flashing details, fastening patterns where applicable for insulation and membrane sheets, and expansion joint details. Detail showing construction of water cutoffs to be used at membrane terminations at the end of a day's work to seal the roofing system from water intrusion.

SD-06 Instructions

Installation; FIO.

Manufacturer's instructions for preparing and installing the membrane, flashings, seams, insulation, nailers and other accessories.

SD-08 Statements

Protection Plan; FIO.

Protection plan showing areas to be protected, type of material used; a plan to protect the membrane from damage until completion of work by other trades, and a description of the method of repairing the roofing.

Inspection; FIO.

An inspection form shall be submitted prior to start of roofing work and shall include a checklist of points to be observed, including at a minimum the items indicated in PARAGRAPH: INSPECTION. The actual inspections shall be documented, and a copy of the documentation shall be furnished to the Contracting Officer at the end of each day.

SD-13 Certificates

Materials; FIO.

Certificates of compliance attesting that the roofing system and materials meet specification requirements. The certificates shall list the components required for the specified fire and wind uplift resistance ratings.

1.3 GENERAL REQUIREMENTS

Elastomeric membrane roofing shall be applied to the roof surfaces indicated. Roofing membrane sheet widths shall be consistent with membrane attachment methods and wind uplift requirements, and shall be as large as practical to minimize joints. Membrane shall be free of defects and foreign material. Flashing work shall be coordinated to permit continuous membrane installation operations. Applied insulation shall be weatherproofed by the membrane on the same day.

1.3.1 Delivery and Storage

Materials shall be delivered to the jobsite in the manufacturer's original, unopened packages, clearly marked with the manufacturer's name, brand name, and description of contents. Materials other than ballast shall be stored in clean, dry areas. Storage temperatures shall be as specified by the manufacturer. Materials other than ballast stored on the roof shall not exceed one day's supply and shall be distributed so as not to exceed the roof live load capacity. Ballast shall be stored uncovered, shall not be in contact with sod or earth, and shall not be stored on the roof.

1.3.2 Fire Resistance

The completed roof system shall have a ASTM E 108 (same test as UL 790 and FM P9513, Appendix A) Class A classification, and meet fire test requirements of UL 1256 or FM P9513, Appendix B for roof deck construction.

Compliance of each component of the roofing system shall be evidenced by label or by written certification from the manufacturer.

1.3.3 Wind Uplift Requirements

Fully adhered and mechanically attached roofing systems shall have a 90 UL 580 Class Rating or FM P9513, Appendix C Windstorm Classification. Ratings from other independent laboratories may be substituted provided that the tests, requirements and ratings are documented to be equivalent, to the satisfaction of the Contracting Officer. Wind resistance of loose-laid ballasted system shall be in accordance with SPRI RP-4.

1.3.4 Warranty

Manufacturer's standard warranty for the roofing system shall be provided for not less than 10 years from acceptance of the work. Warranty shall state that manufacturer shall repair or replace defective materials if the roofing system leaks or allows the insulation beneath the membrane to become wet during the period of the warranty.

PART 2 PRODUCTS

2.1 ADHESIVES

Adhesives, splicing cements, solvents, and sealants shall be as recommended by the membrane manufacturer.

2.2 BALLAST

Ballast shall be concrete pavers and smooth round stone with gradation conforming to ASTM D 448, sizes 2 and 4, with the additional requirement that particles passing the 3/8 inch sieve shall not exceed 2 percent. Unit weight of stone ballast shall be no less than 60 lbs/cu. ft. when determined in accordance with ASTM C 29/C 29M. Concrete pavers shall be precast air-entrained concrete, minimum 1-1/2 inches thick, having 3000 psi minimum compressive strength. Pavers other than walkways shall include drainage channels on their lower surfaces, or shall rest on membrane pads extending at least 1 inch beyond the paver edges.

2.3 FASTENERS

Fasteners for sheet-metal flashing shall be corrosion resistant steel annular-type nails or screws. Fasteners for anchoring the roofing membrane shall be as approved by the membrane manufacturer and identical to those used to obtain the wind uplift rating.

2.4 FLASHING

Flashing shall be of ultra-violet resistant materials as recommended by the membrane manufacturer. Prefabricated shaped flashings shall be used where possible. Sheared edges of metal flashings that contact the membrane shall be turned into a tight hem.

2.5 MEMBRANE

Membrane shall conform to ASTM D 4637, Type I EPDM, Grade 1; Class U, 0.060 inch minimum thickness.

2.6 PREFABRICATED ACCESSORIES

Pipe seals and expansion joint covers shall be types and sizes recommended by the membrane manufacturer.

2.7 SPLASH BLOCKS

Splash blocks shall be precast concrete. Splash blocks shall be 3 feet 0 inch long by 1 foot 0 inch wide by 3 inch nominal depth. Concrete for splash blocks shall have a dry weight of 145 pounds per cubic foot, minimum, compressive strength of not less than 5,000 psi, and water absorption of 5 percent or less.

2.8 INSULATION

As specified in SECTION: INSULATION.

PART 3 EXECUTION

3.1 ENVIRONMENTAL CONDITIONS

Membrane shall not be installed in high wind, inclement weather or when there is visible ice, frost or moisture on the deck, insulation or membrane. Membrane shall not be installed when air temperature is below the minimum specified by the membrane manufacturer.

3.2 PREPARATION

The substrate of any bay or section of the building shall be complete and suitable for insulation and membrane installation before roofing is begun. Surfaces against which membrane is applied shall be smooth, clean, and free from dirt, water, dew, oil, grease, sharp edges and construction debris; all joints over 1/4 inch wide shall be sealed.

3.3 INSTALLATION

Installation shall comply with the manufacturer's approved instructions, except as otherwise specified.

3.3.1 Flashing

Edges of membrane, projections through the roof and changes in roof planes shall be flashed. The flashing material shall be extended and sealed a minimum of 3 inches on each side of the fasteners which attach the membrane to nailers. The installed flashing shall be fastened at the top of the flashing a maximum of 12 inches on center under metal counter-flashing or cap. Factory- prefabricated pipe seals shall be used where possible.

3.3.2 Expansion Joints

Expansion joints shall be covered using prefabricated covers or elastomeric flashing in accordance with the manufacturer's recommendations.

3.3.3 Membrane Installation

Membrane shall be spliced to adjoining sheets using minimum 3 inch wide laps. Direction of lap shall be such that water flows over lap. Membrane joints shall be free of wrinkles or fishmouth. Mating surfaces of joints shall be cleaned. Excess adhesive on splice edges shall be removed with solvents, and joints shall be made watertight. Membrane shall be secured in accordance with the manufacturer's instructions. Joints shall be inspected over entire length after completion, and defective areas shall be resealed where necessary to provide a watertight installation. Damaged areas of membrane shall be removed and recovered, lapping underlying membrane by at least 3 inches on all sides.

3.3.4 Cutoffs

Cutoffs shall be installed if work day is ended or interrupted by bad weather before roof section is complete. The insulation line shall be straightened using loose-laid cut insulation and the membrane shall be sealed to the roof deck. Flutes in metal decking shall be sealed off along the cutoff edge. Membrane shall be pulled free or cut to expose the insulation when resuming work, and cut insulation sheets used for fill-in shall be removed as necessary to maintain the staggered pattern.

3.3.5 Installation of Walkways

Concrete paver walkways shall be installed on a loose-laid pad of the membrane material extending at least 1 inch beyond the walkway material, and as specified by the manufacturer. Stone ballast shall not be placed below or above walkways. Power saw-cut blocks as necessary for irregular shapes and to fit obstructions, and all joints shall be neat, tight, and straight.

3.4 BALLAST

Ballast shall be applied as the membrane is installed to prevent wind uplift, except that seams and terminations shall be left uncovered until completion and inspection. Membrane shall be protected from mechanical damage from wheeled equipment during ballast application. Minimum ballast weight shall not be less than required by SPRI RP-4. Ballast shall be spread as recommended by the manufacturer for the anticipated wind conditions. Unless otherwise specified, size 2 ballast shall be spread at the rate of at least 13 psf and size 4 ballast shall be applied at the rate of at least 10 psf.

3.5 PROTECTION OF FINISHED ROOFING

The roofing membrane shall be protected from damage by other trades. After completion of work by other trades, the protection shall be removed and the roof shall be inspected. Any damage shall be repaired in accordance with the recommendations of the roofing manufacturer.

3.6 INSPECTION

The roofing membrane manufacturer or an authorized representative shall provide such inspection as necessary to determine that the work conforms to the manufacturer's established workmanship standards. The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed elastomeric roofing with the contract requirements. The

procedure shall include a checklist of points to be observed. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of roofing workers; start and end time of various tasks; condition of substrate.
- b. Verification of compliance of materials before, during and after installation.
- c. Inspection of insulation, nailers, flashings, penetrations and work requiring coordination with roofing.
- d. Inspection of membrane placement, splicing, and attachment.
- e. Inspection of placement of ballast and walkways.
- f. Verification of ballast weight.

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SECTION 07600

SHEET METALWORK, GENERAL

PART 1 GENERAL

This section covers the furnishing and installation of sheet metalwork required to complete roofing, and other construction as indicated and specified. Work also includes louvers for exterior wall openings. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in other sections.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1996) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B 32	(1996) Solder Metal
ASTM B 209	(1996) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 370	(1992) Copper Sheet and Strip for Building Construction
ASTM D 226	(1997) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 543	(1995) Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D 822	(1996) Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Exposure Apparatus
ASTM D 828	(1993) Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation-Apparatus
ASTM D 1784	(1996) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D 2822	(1991; R 1997) Asphalt Roof Cement
ASTM D 3656	(1994) Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
ASTM D 4022	(1994) Coal Tar Roof Cement, Asbestos Containing
ASTM D 4586	(1993) Asphalt Roof Cement, Asbestos Free
ASTM E 96	(1995) Water Vapor Transmission of Materials

INSECT SCREENING WEAVERS ASSOCIATION (ISWA)

ISWA IWS 089	(1990) Recommended Standards and Specifications for Insect Wire Screening (Wire Fabric)
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SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-02	(1993; Errata) Architectural Sheet Metal Manual
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1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction.

1.2.1 Coordination

Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Application of bituminous strip flashing over various sheet metal items is covered in Section 07530 ELASTOMERIC ROOFING (EPDM). Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in Section 15895.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Materials; GA.

Drawings of sheet metal items showing weights, gauges or thicknesses; types of materials; expansion-joint spacing; fabrication details; and installation procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Lead, lead-coated metal, and galvanized steel shall not be used. Any metal listed by SMACNA-02 for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA-02. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

2.1.1 Accessories

Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided.

2.1.2 Aluminum Extrusions

ASTM B 221, Alloy 6063, Temper T5. Factory painted to match adjacent metal.

2.1.3 Bituminous Cement

Type I asphalt cement conforming to ASTM D 2822 or ASTM D 4586. For coal tar roofing; coal tar cement conforming to ASTM D 4022.

2.1.4 Sealant

Unless otherwise specified, sealant shall be an elastomeric weather resistant sealant as specified in Section 07900 CAULKING AND SEALANTS.

2.1.5 Fasteners

Fasteners shall be compatible with the fastened material and shall be the type best suited for the application.

2.1.6 Felt

ASTM D 226, Type I.

2.1.7 Polyvinyl Chloride (PVC) Reglets

ASTM D 1784, Class 14333D, 0.075 inch minimum thickness.

2.1.8 Aluminum Alloy Sheet and Plate

ASTM B 209, form, alloy, and temper appropriate for use.

2.1.9 Copper

ASTM B 370, Temper H 00.

2.1.10 Stainless Steel

ASTM A 167, Type 302 or 304; fully annealed, dead soft temper.

2.1.11 Solder

ASTM B 32, 95-5 tin-antimony.

2.1.12 Louver Screen

Type II carbon steel insect screening conforming to ISWA IWS 089.

PART 3 EXECUTION

3.1 GENERAL

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction. Items such as gutters, downspouts and louvers shall be fabricated in conformance with SMACNA-02 and as indicated.

Unless otherwise specified or indicated, exposed edges shall be folded back to form a 1/2 inch hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing.

3.2 EXPANSION JOINTS

Expansion joints shall be provided as specified in SMACNA-02. Expansion joints in continuous sheet metal shall be provided at 40 foot intervals for copper and stainless steel and at 32 foot intervals for aluminum, except extruded aluminum gravel stops and fasciae which shall have expansion joints at not more than 12 foot spacing. Joints shall be evenly spaced. An additional joint shall be provided where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing.

3.3 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

3.3.1 Paint

Aluminum surfaces to be painted shall follow requirements as specified in Section 09900 PAINTING.

3.3.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and cemented to the aluminum surface using a cement compatible with aluminum.

3.4 CONNECTIONS AND JOINTING

3.4.1 Soldering

Soldering shall apply to copper, and stainless steel items. Edges of sheet metal shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.4.2 Riveting

Joints in aluminum sheets 0.040 inch or less in thickness shall be mechanically made.

3.4.3 Seaming

Flat-lock and soldered-lap seams shall finish not less than 1 inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.5 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 1/8 inch apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.6 GUTTERS AND DOWNSPOUTS

Gutters and downspouts shall be installed as indicated. Gutters shall be supported as indicated and supported by cleats spaced not less than 36 inches apart. Downspouts shall be rigidly attached to the building. Supports for downspouts shall be spaced according to manufacturer's recommendations.

3.7 FLASHINGS

Flashings shall be installed at locations indicated and as specified below.

Sealing shall be according to the flashing manufacturer's recommendations.

Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be covered up by an application of bituminous plastic cement at the perforation. Flashing shall be installed on top of joint reinforcement. Flashing shall be formed to direct water to the outside of the system.

3.7.1 Base Flashing

Metal base flashing shall be coordinated with roofing work. Metal base

flashing shall be set in plastic bituminous cement over the roofing membrane, nailed to nailing strip, and secured in place on the roof side with nails spaced not more than 3 inches on centers. Metal base flashing shall not be used on built-up roofing.

3.7.2 Counter Flashings

Except as otherwise indicated, counter flashings shall be provided over base flashings. Counter flashing shall be installed as shown on the drawings, or if not shown on the drawings then in accordance with SMACNA-02.

Where bituminous base flashings are provided, the counter flashing shall extend down as close as practicable to the top of the cant strip. Counter flashing shall be factory formed to provide spring action against the base flashing.

3.7.3 Valley Flashing

Valley flashing shall be installed as specified in SMACNA-02 and as indicated.

3.7.4 Cap Flashing

Cap flashing shall be installed either in a reglet specified in Paragraph: Reglets or shall consist of a two-piece combination unit with the receiver component built in the construction and the cap component interlocking not less than 1-1/2 inches into the receiver. Flange shall be located not less than 8 inches nor more than 16 inches above roofing not having cant strips or shall be located not less than 5 inches nor more than 13 inches above cant strip. Cap flashing shall overlap base flashing not less than 3 inches and when used with reglets, shall extend into reglets not less than 1-1/8 inches. Cap flashing shall be factory formed to provide spring action against the base flashing. Lower edge shall have a longitudinal V-type crimp or shall be folded under not less than 1/2 inch. Cap flashing terminations shall be sealed.

3.8 GRAVEL STOPS AND FASCIA

Gravel stops and fascia shall be fabricated and installed as indicated and in accordance with SMACNA-02.

3.9 INSTALLATION OF LOUVERS

Louvers shall be rigidly attached to the supporting construction. The installation shall be rain-tight. Louver screen shall be installed as indicated.

3.10 REGLETS

Reglets shall be a factory fabricated product of proven design, complete with fittings and special shapes as required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglet plugs shall be spaced not over 12 inches on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 12 inches to crimp the reglet and counter flashing together. Polyvinyl chloride reglets shall be sealed with the manufacturer's recommended sealant.

3.11 SCUPPER LININGS

The interior of scupper openings shall be lined with sheet metal. The lining shall be formed to return not less than 1 inch against both faces of the wall or parapet with the outside edges folded under $\frac{1}{2}$ inch less on the top and sides. The perimeter of the lining shall be approximately $\frac{1}{2}$ inch less than the perimeter of the scupper. The top and sides of scuppers on the roof-deck side shall be joined to base flashing by a locked and soldered joint. The bottom edge shall be joined by a locked and soldered joint to the base flashing and where required, shall be formed with a ridge to act as a gravel stop around the scupper inlet. Surfaces to receive the lining shall be coated with bituminous cement.

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SECTION 07810

SPRAY-APPLIED FIREPROOFING

PART 1 GENERAL

This section covers the furnishing and installation of spray-applied intumescent fireproofing in Room 115 of the new Central Control Building as indicated and specified herein.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 119	(1998) Fire Tests of Building Construction and Materials
ASTM E 605	(1993; R 1996) Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM E 736	(1992) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E 759	(1992; R 1996) Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E 760	(1992; R 1996el) Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E 761	(1992) Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E 937	(1993) Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM G 21	(1996) Determining Resistance of Synthetic Polymeric Materials to Fungi

UNDERWRITERS LABORATORIES (UL)

UL 263	(1997; Rev Jun 1998) Fire Tests of Building Construction and Materials
UL Fire Resist Dir	(1998) Fire Resistance Directory (2 Vol.)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Fireproofing Material; FIO.

Data identifying performance characteristics of fireproofing material. Data shall include recommended application requirements and indicate thickness of fireproofing that must be applied to achieve each required fire rating, and instructions from the manufacturer for applying spray-on fireproofing.

SD-09 Reports

Field Tests; FIO.

Test reports documenting results of tests on the applied material in the project. Report shall include defects identified, repair procedures, and results of the retests when required.

SD-13 Certificates

Installer Qualifications; FIO.

Manufacturer's certification that each listed installer is qualified and trained to install the specified fireproofing.

SD-14 Samples

Spray-Applied Fireproofing; GA.

One sample panel on representative substrate, 4 inches square, for fireproofing.

1.3 DELIVERY AND STORAGE

Packaged material shall be delivered in the original unopened containers, marked to show the names of the brand and the manufacturer. Fireproofing material shall be kept dry until ready to be used, and shall be stored off the ground, under cover and away from damp surfaces. Damaged or opened containers will be rejected. Material with shelf-life shall be applied prior to expiration of the shelf-life.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Substrate and ambient air temperatures shall be maintained above 40 degrees F during application and for 24 hours before and after application. Relative humidity shall be maintained within the limits recommended by the fireproofing manufacturer.

1.4.2 Ventilation

Adequate ventilation shall be provided to properly dry the fireproofing after application. In enclosed areas, a minimum of 4 air exchanges per hour shall be provided by forced air circulation.

1.5 INSTALLER QUALIFICATIONS

The Contractor shall be approved by the respective material supplier to apply fireproofing and shall furnish a certificate indicating approval.

1.6 FIRE RESISTANCE RATING

Fire resistance ratings shall be in accordance with the fire rated assemblies listed in UL Fire Resist Dir. Proposed materials not listed in UL Fire Resist Dir shall have fire resistance ratings at least equal to the UL Fire Resist Dir ratings as determined by an approved independent testing laboratory, based on tests specified in UL 263 or ASTM E 119.

PART 2 PRODUCTS

2.1 FIREPROOFING

Fireproofing shall be a spray applied intumescent material designed to be finished with a smooth surface. The product shall be listed by UL and bear the UL label on each material container. Fireproofing materials shall be free of all forms of asbestos material. The fireproofing material shall be compatible with any paint or primer applied to the substrate.

2.1.1 Fire Resistance Rating

The fireproofing shall be applied to a thickness that will provide a one hour rating. Fire resistance ratings shall be in accordance with the fire rated assemblies listed in UL-05. Proposed assemblies not listed in UL-05 shall have fire resistance ratings at least equal to the UL-05 ratings as determined by an independent testing laboratory based on tests specified in UL 263 or ASTM E 119.

2.1.2 Performance Testing

Spray-applied fireproofing material shall conform to the following requirements and testing. Fire proofing shall not be tamped to achieve the specified density.

<u>Test</u>	<u>Method</u>	<u>Minimum Value</u>
Dry applied density	ASTM E 605	40 pcf
Compressive strength	ASTM E 761	400 psi
Cohesive/adhesive strength (bond strength)	ASTM E 736	5000 psf
Impact resistance	ASTM E 760	No cracking, spalling or Deflection
Delamination	ASTM E 759	No cracking, spalling or delamination
Corrosion	ASTM E 937	No contribution

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be fireproofed shall be thoroughly cleaned of dirt, grease, oil, paint, loose rust, rolling lubricant, mill scale or other contaminants that will interfere with the proper bonding of the sprayed fireproofing to the substrate. Overhead areas to be fireproofed shall be cleared of all obstructions interfering with the uniform application of the spray-applied fireproofing. Hardware such as support sleeves, inserts, clips, hanger attachment devices and the like shall be installed prior to the application of the fireproofing. Condition of the surfaces shall be acceptable to the manufacturer prior to application of spray-applied fireproofing. Applications listed for use on primed surfaces shall be coordinated with the manufacturer and detailed in submittals.

3.2 PROTECTION

Surfaces not to receive spray-applied fireproofing shall be covered to prevent contamination by splatter, rebound and overspray. Exterior openings in areas to receive spray-applied fireproofing shall be covered prior to and during application of fireproofing with tarpaulins or other approved material. Surfaces not to receive fireproofing shall be cleaned of fireproofing and sealer.

3.3 MIXING

Fireproofing material shall be mixed in accordance with the manufacturer's recommendations.

3.4 APPLICATION

3.4.1 Sequence

Prior to application of fireproofing on each floor, the manufacturer shall inspect and approve application equipment, water supply and pressure, and the application procedures. Fireproofing shall be applied to underside of steel roof deck or steel floor assemblies only after respective roof or floor construction is complete. Fireproofing material shall be applied prior to the installation of ductwork, piping and conduits which would interfere with uniform application of the fireproofing. The Contractor shall not allow roof traffic during application and curing period.

3.4.2 Application Technique

Fireproofing material shall be applied to a thickness as required to obtain the specified fire resistance rating and to provide a fire-protective coating of uniform density and texture. Portland cement - vermiculite products shall have a troweled finish.

3.5 FIELD TESTS

Sprayed material shall be tested for thickness in accordance with ASTM E 605, by an approved independent testing laboratory. Thickness determinations shall be taken at one beam and column. Final inspection of

sprayed areas shall be conducted after mechanical, electrical, and other work in contact with fireproofing material has been completed and before sprayed material is covered.

3.5.1 Repair

Areas requiring additional fireproofing material to provide proper thickness for the specified fire resistance rating shall be corrected. Fireproofing material shall be applied to voids or damaged areas by respraying with a mask, to prevent overspray on surrounding areas.

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SECTION 07840

FIRESTOPPING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84	(1998e1) Surface Burning Characteristics of Building Materials
ASTM E 119	(1998) Fire Tests of Building Construction and Materials
ASTM E 814	(1997) Fire Tests of Through-Penetration Fire Stops

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996; Errata 96-4) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL 723	(1996) Test for Surface Burning Characteristics of Building Materials
UL 1479	(1994; Rev thru Feb 1998) Fire Tests of Through-Penetration Firestops
UL 2079	(1998) Tests for Fire Resistance of Building Joint Systems
UL Fire Resist Dir	(1998) Fire Resistance Directory (2 Vol.)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Firestopping Materials; GA.

Manufacturer's descriptive data, typical details, installation

instructions, and the fire test data and/or reports as appropriate for the time-rated construction and location.

SD-13 Certificates

Firestopping Materials; FIO.

Certificates attesting that firestopping material complies with the specified requirements. The label or listing of the Underwriters Laboratories will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing agency equipped to perform such services, stating that the items have been tested and conform to the specified requirements and testing methods.

1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof deck.

1.4 STORAGE AND DELIVERY

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.5 INSTALLER QUALIFICATIONS

Installer of firestopping material shall be trained by the manufacturer or the manufacturer's representative.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured products complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resist Dir or by a nationally recognized testing laboratory.

2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application.

2.1.3 Fire Resistance Rating

Materials used to seal penetrations in time-rated assemblies shall be capable of preventing the pass of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions for one hour.

Materials used to seal openings between floor slabs and walls shall be capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions for one hour at a 2 inch wide opening between floor slab edge and vertical wall assembly.

Material shall not require a rise in temperature to install or activate seal.

2.2 CABLE VAULT SEALANT

Cable vault sealant shall be a medium density, two-part silicone RTU foam. The sealant shall meet UL 1479 for one-hour fire resistance. The sealant shall cure to create a compressive fit, shall be removable, and shall be maintainable. It shall have a temperature range of -67 to +392 degrees Celsius. The sealant shall have no injurious effect upon the hands of workmen or upon equipment.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system.

3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Firestopping shall be provided in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies. Cutting and patching of construction and providing sleeves, where required, are shown on drawings or specified in other sections.
- b. Penetrations of vertical shafts such as pipe chases and utility chutes.
- c. Gaps at the intersection of floor slabs and walls.

- d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where shown.

3.3 Insulated Pipes and Ducts

Insulated pipes and ducts penetrating fire-rated floors and walls shall be insulated with materials that provide the same performance as the firestopping material. This material shall extend a minimum of 6 inches on each side of the opening. Vapor barrier of such insulation shall have a perm rating of 0.03 maximum.

3.4 Electrical Cables or Conduits

Firestopping at penetrations of electrical cables or conduits shall also comply with the requirements of NFPA 70. Cable vault sealant as specified in paragraph: Cable Vault Sealant above shall be installed at the cable vault only. Installation of cable vault sealant shall be as recommended by the sealant manufacturer to provide a water and fire seal around cables, tray, and conduit. The sealant shall be applied to a minimum thickness of 1 inch, filling all geometrical gaps and waterproofing all cable penetrations.

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SECTION 07900

CAULKING AND SEALING

PART 1 GENERAL

This section covers the furnishing and installation of all caulking and sealing not specified elsewhere.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 570	(1995) Oil- and Resin-Base Caulking Compound for Building Construction
ASTM C 920	(1995) Elastomeric Joint Sealants
ASTM C 1085	(1991) Butyl Rubber-Based Solvent-Release Sealants
ASTM C 1184	(1995) Structural Silicone-Sealants
ASTM D 217	(1994) Cone Penetration of Lubricating Grease (IP50/88)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Descriptive Data; GA.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.1 Performance Requirements

Materials shall conform to the respective specifications and other requirements specified. Each container brought to the jobsite with a different sealant formulation shall be marked for the intended use. For each intended use, the color shall be one of the manufacturer's standard colors as selected by the Contracting Officer's Representative.

2.2 No. 1 Caulking Compound

No. 1 caulking compound shall conform to ASTM C 570, Type 1, and shall be used for interior joints in interior walls.

Sealer for use with No. 1 caulking compound shall be aluminum paint.

2.3 No. 2 Sealant

No. 2 sealant shall be a one-component, elastomeric type compound conforming to ASTM C 920, Type S or M, Grade NS, or a butyl rubber sealant conforming to ASTM C 1085, or a silicone sealant conforming to ASTM C 1184.

No. 2 sealant shall be used for exterior joints and the interior side of joints in exterior walls.

Primer for No. 2 sealant shall be non-staining type and shall be as recommended by the sealant manufacturer. Primer shall have been tested for durability with the sealant to be used and on samples of the surfaces to be sealed.

2.4 Backstop material

Backstop material shall be resilient urethane or polyvinyl chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oilless dry jute, or rope yarn. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity. Preformed support strips for ceramic and quarry tile control joint and expansion joint work shall be polyisobutylene or polychloroprene rubber.

2.5 Bond-preventive materials

Bond-preventive materials shall be pressure-sensitive adhesive polyethylene tape, aluminum foil, or wax paper. At the option of the Contractor, backstop material with bond-breaking characteristics may be installed, in lieu of bond-preventive materials specified.

PART 3 EXECUTION

3.1 GENERAL

Caulking and sealants shall be provided in joints as indicated or specified. The joint design, shape, and spacing shall be as indicated. Mixing shall be in accordance with instructions provided by the manufacturer of the sealants.

3.1.1 Surface Preparation

The surfaces of joints to receive sealant or caulk shall be free of all frost, condensation and moisture. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant.

Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.2 APPLICATION

Except as described in SECTION: CONCRETE WALKS; SECTION: EXPANSION

JOINTS, CONTRACTION JOINTS, AND WATER STOPS; and SECTION: HORIZONTAL AND VERTICAL CONCRETE SURFACE REPAIR, installation of caulking and sealing materials shall be as described below.

3.2.1 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-preventive materials for No. 2 sealant shall be installed on the bottom of the joint cavity and other surfaces indicated to prevent the sealant from adhering to the surfaces covered by the bond-preventive materials. The materials shall be carefully applied to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond-preventive materials.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 No. 1 Caulking Compound

Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Caulking shall be uniformly smooth and free of wrinkles and shall be left sufficiently convex to result in a flush joint when dry. One coat of sealer shall be applied over joint after compound has dried sufficiently to develop a surface skin so as not to deform the surface of the joint.

3.2.6 No. 2 Sealant

Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Sealant shall be uniformly smooth and free of wrinkles. Joints shall be tooled slightly concave after sealant is installed. When tooling white or light-color sealant, dry or water-wet tool shall be used.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and

other soiling resulting from the sealant application as work progresses.

-- End of Section --